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# AERIAL PHOTOGRAPHIC ANALYSIS OF THE UNION OIL REFINERY SITE

Lemont, Illinois

by

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NOTICE

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ABSTRACT

This report presents single-date analysis of the Union Oil Refinery site located near Lemont, Illinois. Conventional color aerial photography acquired on April 17, 1986 was used to perform the analysis.

The 840-acre Union Oil Refinery site is a petroleum product and chemical facility. The focus of the analysis was on locating potential sources of ground-water contamination, with emphasis on landfills, tanks, drums, and lagoons. Oil product spillage was visible at several points both inside and outside containments. Evidence of contamination of the in-site drainage network was observed. All nine lagoons at the site were unlined at the time of photography. No evidence of leakage was observed at any of the drums; however, leakage was associated with several tanks.

The U.S. Environmental Protection Agency's Environmental Monitoring Systems Laboratory in Las Vegas, Nevada, prepared this report for the Agency's Environmental Services Division in Region 5 at Chicago, Illinois, and Office of Solid Waste in Washington, D.C. The report was prepared to document physical conditions at the site.

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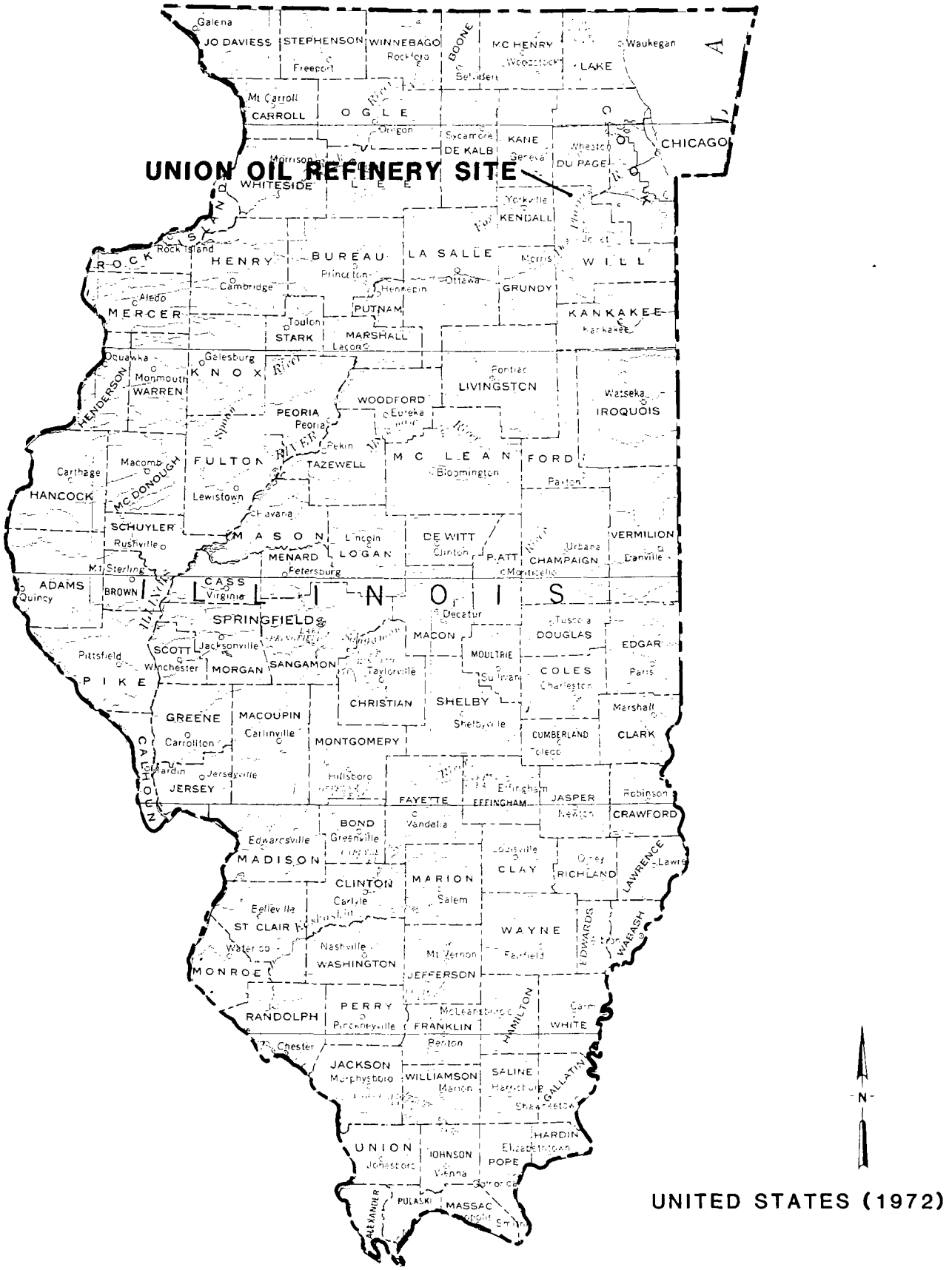


Figure 1. Site location map, Illinois. Scale 1:2,800,000.

# INTRODUCTION

This report presents single-date analysis of the Union Oil Refinery site located on the Illinois Michigan Canal approximately one mile southwest of Lemont, Illinois (Figure 2). The report was prepared to document physical conditions and potential environmental hazards at the site. Conventional color aerial photography acquired on April 17, 1986 was used to perform the analysis.

The Union Oil Refinery is a petroleum product refinery and chemical facility involved in the production of Benzene, sulfur, toluene, and mixed xylenes. Various other organic compounds including aliphatic napthas, butane, and propane are also produced. The focus of the analysis is on locating and evaluating potential sources of ground-water contamination with specific emphasis on lagoons, landfills, drums, and tanks. Background information on the site was obtained from 1985 Directory of Chemical Producers; United States of America.

This report was produced by the U.S. Environmental Protection Agency's Environmental Monitoring Systems Laboratory in Las Vegas, Nevada, at the request of the Agency's Environmental Services Division in Region 5 at Chicago, Illinois and Office of Solid Waste in Washington, D.C.

The following table lists all the Region 5 sites covered under this project.

TABLE 1. REGION 5 SITES COVERED UNDER TS-AMD-86612†

| Report serial number† | Site name | Location | Analysis type |
|---|---|---|---|
| 1 | McCook Lead Supply | McCook, IL | Single-date |
| 2 | LaClede Steel | Alton, IL | Single-date |
| 3 | Union Oil Refinery‡ | Lemont, IL | Single-date |
| 4 | Shell Oil Refinery | Wood River, IL | Single-date |
| | Shell Riverfront | Wood River, IL | Single-date |
| 5 | Amoco Oil Refinery | Wood River, IL | Single-date |
| | Amoco Riverfront | Wood River, IL | Single-date |
| 6 | Marathon Oil Refinery | Robinson, IL | Single-date |

†To identify individual reports, add the report serial number to the series number.

‡Sites covered in this report.

## METHODOLOGY

Stereoscopic pairs of historical and current aerial photographs are used to perform the analysis. Stereo viewing enhances the interpretation because it allows the analyst to observe the vertical as well as horizontal spatial relationships of natural and cultural features. Stereoscopy is also an aid in distinguishing between various shapes, tones, textures, and colors that can be found within the study area.

Evidence of waste burial is a prime consideration when conducting a hazardous waste analysis. Leachate or seepage resulting from burial and dumping of hazardous materials might threaten existing surface or ground-water sources. Pools of unexplained liquid are routinely noted because they can indicate seepage from buried wastes that may enter drainage channels and allow contaminants to move off the site. An excellent indicator of how well hazardous materials are being handled at a site is the presence or absence of spills, spill stains, and vegetation damage. Trees and other forms of vegetation that exhibit a marked color difference from surrounding members of the same species are labeled "dead," "stressed," or "damaged" based upon the degree of noticeable variation. Vegetation is so labeled only after consideration of the season in which the photographs were acquired.

The U.S. Environmental Protection Agency's Statement of Procedures on Floodplain Management and Wetlands Protection (Executive Orders 11988 and 11990, respectively) requires EPA to determine if removal or remedial actions at hazardous waste sites will affect wetlands or flood plains and to avoid or minimize adverse impacts on those areas. To aid in compliance with these orders, significant wetland areas located within and adjacent to the sites have been identified and delineated. However, the sites have not been visited to verify the accuracy of wetland identification.

Drainage analysis determines the direction a spill or surface runoff would follow. Direction of drainage is determined from analysis of the photographs and from U.S. Geological Survey topographic maps. Whenever they are available, 7.5-minute quadrangle maps (scale 1:24,000) are used to show site location and to provide geographic and topographic information.

Results of the analysis are shown on annotated overlays attached to the photos. The prints in this report have been enlarged when appropriate to show maximum detail. The following table provides specifications of the photographs used in this report.

TABLE 2. DOCUMENTATION OF AERIAL PHOTOGRAPHY

| Site name, location, and geographic coordinates | Figure | Date of acquisition | Original scale | Film type† | Photo source‡ |
|---|---|---|---|---|---|
| Union Oil Refinery<br>Lemont, Illinois<br>(41°39.0'N 088°03.0'W) | 3-11 | April 27, 1986 | 1:24,000 | CC | EMSL |

†Film type identification:
CC: Conventional color

‡Photo source identification:
EMSL: U.S. Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Las Vegas, Nevada.

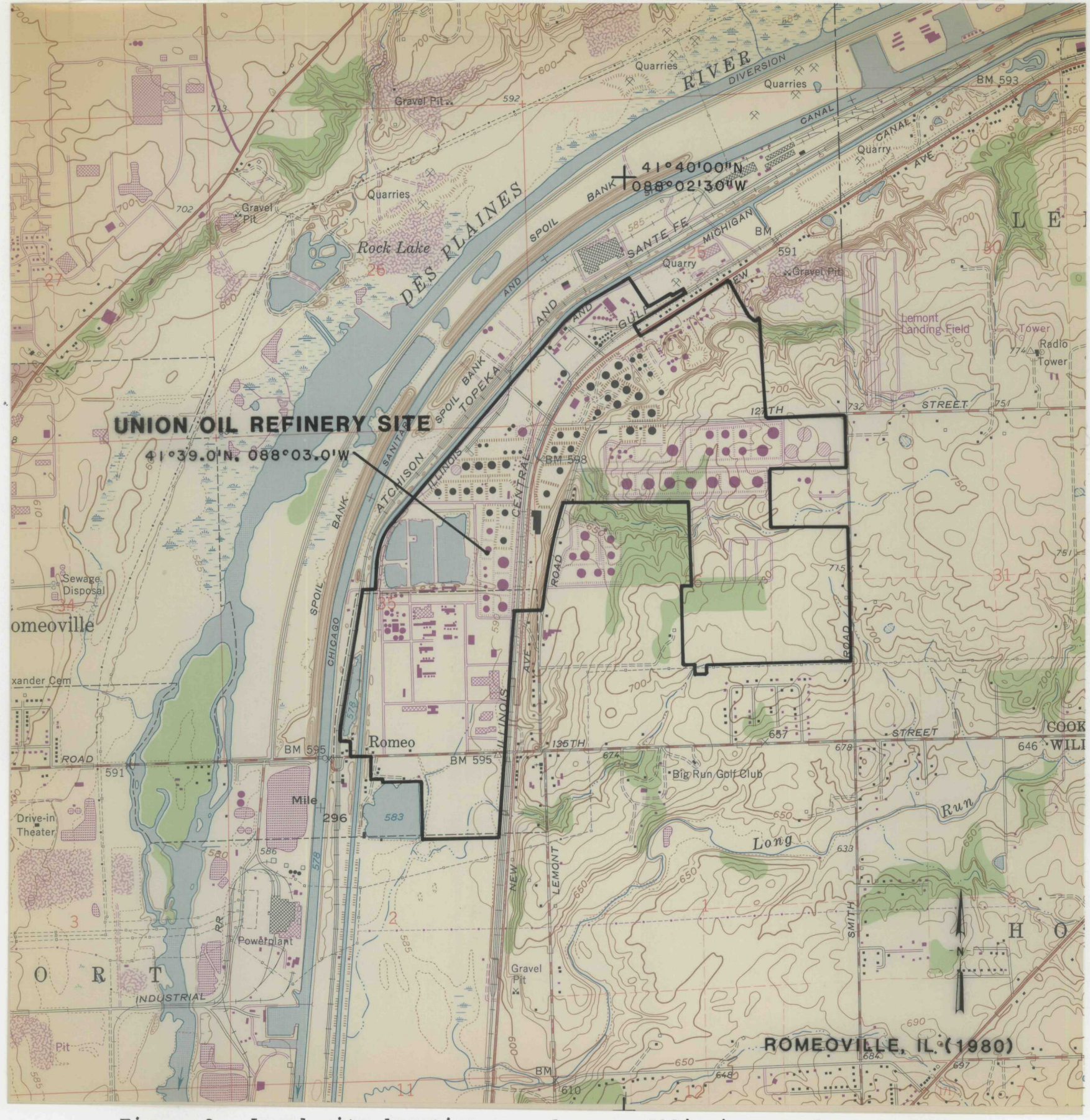


Figure 2. Local site location map, Lemont, Illinois. Scale 1:24,000.

## ANALYSIS SUMMARY

The Union Oil Refinery site is located on the Illinois and Michigan Canal approximately one mile southwest of Lemont, Illinois. The site occupied 840 acres at its greatest extent. Conventional color aerial photographs acquired on April 27, 1986 were used to perform the analysis.

Terrain at the site is divided between flat bottomland along the Illinois Michigan Canal and rolling agricultural uplands in the eastern part of the site. Three intermittent streams enter the site from these uplands. Drainage generally is to the west. An internal drainage network has been constructed in the section of the site west of the Illinois Central Gulf railroad tracks. This network trends to the south and empties into the Illinois and Michigan Canal. Most of the site lies within the floodplain of the Des Plaines River and would probably be heavily imparted by a 100-year flood event. No wetlands are located in or adjacent to the site.

Analysis of the photography showed fairly good housekeeping practices had been followed at the site; however, significant potential contamination sources were also evident. Spillage was visible outside containments at five locations. These spills pose an indirect threat to the internal drainage network. A collection of abandoned tanks showed staining which indicates that liquid had entered the adjacent drainage channel. Further evidence of contamination of the on-site drainage was noted at annotation A. The nine lagoons at the site are all unlined. No leakage was observed at any of the drum storage areas; however, one of these was located in close proximity to a drainage channel. Numerous stains usually associated with storage tanks were visible at various points within the site. All of these appeared to be petroleum product except two. Large amounts of standing liquid within eight containment dikes could increase the likelihood of a tank leak overflowing the containment.

PHOTO ANALYSIS

APRIL 17, 1986 (1 of 9)

Figures 3-11 show a high level of activity at the site. Primary refining complexes are located along the Illinois and Michigan Canal on the west side of the site, with bulk oil storage areas further east. Drainage in the area is generally from east-to-west. A network of channels running through the site carry runoff in the same general direction toward outfalls on the Illinois and Michigan Canal (Figure 11). Significant features at the site are:

| | |
|---|---|
| +1 | Spillage at #1 consists of pools of product on the ground below loading racks. |
| +2 | Number 2 is an older spill of oily liquid originating at the adjacent flare tower. |
| +3 | Extensive spillage at #3 lies within a containment dike; however, the source is not apparent. |
| +6 | Number 6 is an older spill which appears to be the result of uncontrolled dumping on the roadway. |
| ST1 | Staining at #1 is an old spill on open ground. Due to its location it may be the result of a tank truck spill. |


## INTERPRETATION CODE

### BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

### DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

### TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

### SITE FEATURES

- DIKE
- STANDING LIQUID
- SL STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM MOUNDED MATERIAL (SMALL)
- CR CRATES/BOXES
- DR DRUMS
- HT HORIZONTAL TANK
- PT PRESSURE TANK
- VT VERTICAL TANK
- CA CLEARED AREA
- DG DISTURBED GROUND
- FL FILL
- IM IMPOUNDMENT
- LG LAGOON
- OF OUTFALL
- SD SLUDGE
- ST STAIN
- SW SOLID WASTE
- TR TRENCH
- VS VEGETATION STRESS
- WD WASTE DISPOSAL AREA
- WL WETLAND

Figure 3. Union Oil Refinery site, April 17, 1986 (1 of 9). Approximate scale 1:5,000.

The old fill area and spoil deposits are potential waste burial areas; however, no visible evidence of waste disposal activity or other contamination source is evident. No leakage is visible at the tank trailers.


## INTERPRETATION CODE

### BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

### DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

### TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

### SITE FEATURES

- DIKE
- STANDING LIQUID
- SL — STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM — MOUNDED MATERIAL (SMALL)
- CR — CRATES/BOXES
- DR — DRUMS
- HT — HORIZONTAL TANK
- PT — PRESSURE TANK
- VT — VERTICAL TANK
- CA — CLEARED AREA
- DG — DISTURBED GROUND
- FL — FILL
- IM — IMPOUNDMENT
- LG — LAGOON
- OF — OUTFALL
- SD — SLUDGE
- ST — STAIN
- SW — SOLID WASTE
- TR — TRENCH
- VS — VEGETATION STRESS
- WD — WASTE DISPOSAL AREA
- WL — WETLAND

Figure 4. Union Oil Refinery site, April 17, 1986 (2 of 9). Approximate scale 1:5,000.

APRIL 17, 1986 (3 of 9)

+7 - Spills at this point consist of dark liquid apparently originating at an adjacent pipeline.

ST2-5 - These stains are dark-toned stains within containment dikes which are the results of old spills.


## INTERPRETATION CODE

### BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

### DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

### TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

### SITE FEATURES

- DIKE
- STANDING LIQUID
- SL STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM MOUNDED MATERIAL (SMALL)
- CR CRATES/BOXES
- DR DRUMS
- HT HORIZONTAL TANK
- PT PRESSURE TANK
- VT VERTICAL TANK
- CA CLEARED AREA
- DG DISTURBED GROUND
- FL FILL
- IM IMPOUNDMENT
- LG LAGOON
- OF OUTFALL
- SD SLUDGE
- ST STAIN
- SW SOLID WASTE
- TR TRENCH
- VS VEGETATION STRESS
- WD WASTE DISPOSAL AREA
- WL WETLAND

Figure 5. Union Oil Refinery site, April 17, 1986 (3 of 9). Approximate scale 1:5,000.

Large amounts of standing liquid are noted in several of the tank containments.

+8 and 9 - Spillage at these points are extensive accumulations of oil product which originate at adjacent storage tanks. All of these spills lie within containment dikes.

+10 - Small amounts of spillage at #10 is also associated with large storage tanks; however, the lighter orange hue distinguishes it from other spills.

ST6 - This stain is a dark-toned stain within containment dikes which is the result of an old spill.

DR1 - These are small accumulations of drums. No leakage is visible at either of them.


## INTERPRETATION CODE

### BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

### DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

### TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

### SITE FEATURES

- DIKE
- STANDING LIQUID
- SL STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM MOUNDED MATERIAL (SMALL)

- CR CRATES/BOXES
- DR DRUMS
- HT HORIZONTAL TANK
- PT PRESSURE TANK
- VT VERTICAL TANK

- CA CLEARED AREA
- DG DISTURBED GROUND
- FL FILL
- IM IMPOUNDMENT
- LG LAGOON
- OF OUTFALL
- SD SLUDGE
- ST STAIN
- SW SOLID WASTE
- TR TRENCH
- VS VEGETATION STRESS
- WD WASTE DISPOSAL AREA
- WL WETLAND

Figure 6. Union Oil Refinery site, April 17, 1986 (4 of 9). Approximate scale 1:5,000.

APRIL 17, 1986 (5 of 9)

The approximate reported locations of three drinking water wells are depicted. Significant features are.

LG1-3 - A complex of lagoons are located on the outskirts of the site. Number 3 is still active and contains a pale greenish liquid, possibly water. The purpose of these lagoons is not apparent.


## INTERPRETATION CODE

### BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- XXXXXX FENCE
- STUDY AREA

### DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

### TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

### SITE FEATURES

- DIKE
- STANDING LIQUID
- SL STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
- MM MOUNDED MATERIAL (SMALL)
- CR CRATES/BOXES
- DR DRUMS
- HT HORIZONTAL TANK
- PT PRESSURE TANK
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Figure 7. Union Oil Refinery site, April 17, 1986 (5 of 9). Approximate scale 1:5,000.

LG4,6-8 - Lagoons 4-8 are settling basins linked by culverts and drains. Number 8 appears to be the final basin as it contains a skimming boom.

LG5 and 9 - Sludge deposits are visible in #5. Lagoon 9 is a sludge lagoon.

+11 - Small amounts of spillage at #11 is also associated with large storage tanks; however, the lighter orange hue distinguishes it from other spills.

+12 - Spillage at #12 has a light-yellow hue and appears to originate at nearby processing equipment. This is possibly sulfur.

+13 - Spills at this point consist of dark liquid apparently originating at an adjacent pipeline.

ST7 - Heavy staining at this location is probably coal dust.

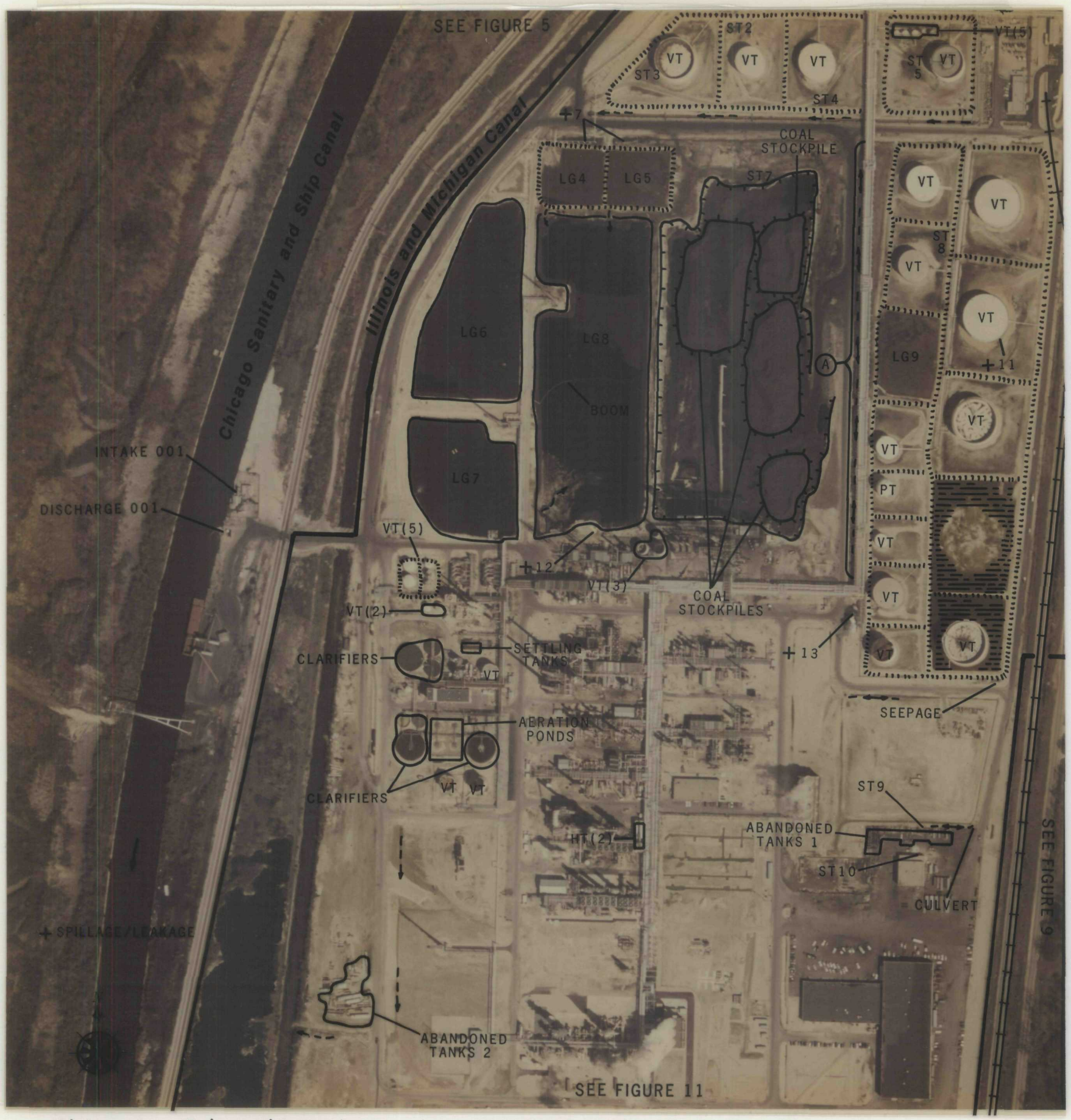
ST8 - This stain is a dark-toned stain within containment dikes which is the result of an old spill.

Annotation A - This is a section of a drainage ditch running below a large number of pipelines. This section contains oily dark-hued liquid suggesting that the internal site drainage network has been contaminated by oil product spillage. The source of this contamination is not apparent.

Abandoned Tanks 1 - Abandoned tanks are being stored at two locations. Spill stains (ST9) are visible at several of the 35 tanks in this area. These stains lead directly into the adjacent drainage channel.

Abandoned Tanks 2 - No staining or spillage is evident at these tanks.

Discharge 001 is active at the time of photography.




## INTERPRETATION CODE

### BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

### DRAINAGE

- DRAINAGE
- FLOW DIRECTION
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### TRANSPORTATION/UTILITY

- VEHICLE ACCESS
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### SITE FEATURES

- DIKE
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Figure 8. Union Oil Refinery site, April 17, 1986 (6 of 9). Approximate scale 1:5,000.

No significant features are observed.


## INTERPRETATION CODE

### BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
- UNFENCED SITE BOUNDARY
- FENCE
- STUDY AREA

### DRAINAGE

- DRAINAGE
- FLOW DIRECTION
- INDETERMINATE DRAINAGE

### TRANSPORTATION/UTILITY

- VEHICLE ACCESS
- RAILWAY

### SITE FEATURES

- DIKE
- STANDING LIQUID
- SL STANDING LIQUID
- EXCAVATION, PIT (EXTENSIVE)
- MOUNDED MATERIAL (EXTENSIVE)
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Figure 9. Union Oil Refinery site, April 17, 1986 (7 of 9). Approximate scale 1:5,000.

A residential subdivision is the closest large residential area to the property, however, these homes are still well separated from the refinery itself.


## INTERPRETATION CODE

### BOUNDARIES AND LIMITS

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Figure 10. Union Oil Refinery site, April 17, 1986 (8 of 9). Approximate scale 1:5,000.

DR2 and 3 - Drums at this point are stored immediately above a drainage ditch which carries runoff from the site into the Illinois and Michigan Canal. Any leakage from these drums would flow directly into the channel.

Two extensive filled areas are located on the southern edge of the site. These areas support heavy vegetation and have been inactive for some time. Some refuse visible on one of the areas suggests that dumping may have occurred in this area.


## INTERPRETATION CODE

### BOUNDARIES AND LIMITS

- FENCED SITE BOUNDARY
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- DG DISTURBED GROUND
- FL FILL
- IM IMPOUNDMENT
- LG LAGOON
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- SD SLUDGE
- ST STAIN
- SW SOLID WASTE
- TR TRENCH
- VS VEGETATION STRESS
- WD WASTE DISPOSAL AREA
- WL WETLAND

Figure 11. Union Oil Refinery site, April 17, 1986 (9 of 9). Approximate scale 1:5,000.

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